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SCIENCE

A RUSKIN ANTHOLOGY

COMPILED BY

WM. SLOANE KENNEDY

NEW YORK:
JOHN B. ALDEN, PUBLISHER.
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"I have always thought that more true force of persuasion might be obtained by rightly choosing and arranging what others have said, than by painfully saying it again in one's own way."
—RUSKIN, Fors Clavigera, Vol. I., p. 281.

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A RUSKIN ANTHOLOGY.

PART IV.—SCIENCE.

CHAPTER I.

Serpents and Birds.

SERPENTS.

A spectral Procession of spotted Dust.—The serpent crest of the king's crown, or of the god's, on the pillars of Egypt, is a mystery; but the serpent itself, gliding past the pillar's foot, is it less a mystery? Is there, indeed, no tongue, except the mute forked flash from its lips, in that running brook of horror on the ground? . . . That rivulet of smooth silver—how does it flow, think you? It literally rows on the earth, with every scale for an oar; it bites the dust with the ridges of its body. Watch it, when it moves slowly:—A wave, but without wind! a current, but with no fall! all the body moving at the same instant, yet some of it to one side, some to another, or some forward, and the rest of the coil backwards; but all with the same calm will and equal way—no contraction, no extension; one soundless, causeless, march of sequent rings, and spectral procession of spotted dust, with dissolution in its fangs, dislocation in its coils. Startle it;—the winding stream will become a twisted arrow;—the wave of poisoned life will lash through the grass like a cast lance. It scarcely breathes with its one lung (the other shrivelled and abortive); it is passive to the sun and shade, and is cold or hot like a stone; yet "it can outclimb the monkey, outswim the fish, outleap the zebra, outwrestle the athlete, and crush the tiger." It is a

divine hieroglyph of the demoniac power of the earth—of the entire earthly nature. As the bird is the clothed power of the air, so this is the clothed power of the dust; as the bird the symbol of the spirit of life, so this of the grasp and sting of death. —*Athena*, p. 58.

A Honeysuckle with a Head put on.—I said that a serpent was a honeysuckle with a head *put on*. You perhaps thought I was jesting; but nothing is more mysterious in the compass of creation than the relation of flowers to the serpent tribe. . . . In the most accurate sense, the honeysuckle is an *anguis*—a strangling thing. The ivy stem increases with age, without compressing the tree trunk, any more than the rock, that it adorns; but the woodbine retains, to a degree not yet measured, but almost, I believe, after a certain time, unchanged, the first scope of its narrow contortion; and the growing wood of the stem it has seized is contorted with it, and at last paralyzed and killed.—*Deucalion*, p. 189.

Deadly Serpents all have sad Colors.—The fatal serpents are all of the French school of art—French gray; the throat of the asp, French blue, the brightest thing I know in the deadly snakes. The rest are all gravel color, mud color, blue-pill color, or in general, as I say, French high-art color. —*Deucalion*, p. 191.

A Serpent in Motion.—You see that one-half of it can move anywhere without stirring the other; and accordingly you may see a foot or two of a large snake's body moving one way, and another foot or two moving the other way, and a bit between not moving at all; which I, altogether, think we may specifically call "Parliamentary" motion. —*Deucalion*, p. 193.

A Serpent's Tongue.—But now, here's the first thing, it seems to me, we've got to ask of the scientific people, what use a serpent has for his tongue, since it neither wants it to talk with, to taste with, to hiss with, nor, so far as I know, to

lick with, and least of all to sting with; and yet, for people who do not know the creature, the little vibrating forked thread, flashed out of its mouth, and back again, as quick as lightning, is the most threatening part of the beast; but what is the use of it? Nearly every other creature but a snake can do all sorts of mischief with its tongue. A woman worries with it, a chameleon catches flies with it, a snail files away fruit with it, a humming-bird steals honey with it, a cat steals milk with it, a pholas digs holes in rocks with it, and a gnat digs holes in *us* with it; but the poor snake cannot do any manner of harm with it whatsoever; and what is *his* tongue forked for?—*Deucalion*, p. 185.

How Eels swim.—Nothing in animal instinct or movement is more curious than the way young eels get up beside the waterfalls of the highland streams. They get first into the jets of foam at the edge, to be thrown ashore by them, and then wriggle up the smooth rocks—heaven knows how. If you like, any of you, to put on greased sacks, with your arms tied down inside, and your feet tied together, and then try to wriggle up after them on rocks as smooth as glass, I think even the skilfulest members of the Alpine Club will agree with me as to the difficulty of the feat; and though I have watched them at it for hours, I do not know how much of serpent, and how much of fish, is mingled in the motion.—*Deucalion*, p. 188.

BIRDS.

The bird is little more than a drift of the air brought into form by plumes; the air is in all its quills; it breathes through its whole frame and flesh, and glows with air in its flying, like blown flame: it rests upon the air, subdues it, surpasses it, outraces it;—*is* the air, conscious of itself, conquering itself, ruling itself.

Also, into the throat of the bird is given the voice of the air. All that in the wind itself is weak, wild,

useless in sweetness, is knit together in its song. As we may imagine the wild form of the cloud closed into the perfect form of the bird's wings, so the wild voice of the cloud into its ordered and commanded voice; unwearied, rippling through the clear heaven in its gladness, interpreting all intense passion through the soft spring nights, bursting into acclaim and rapture of choir at daybreak, or lisping and twittering among the boughs and hedges through heat of day, like little winds that only make the cowslip bells shake, and ruffle the petals of the wild rose.

Also, upon the plumes of the bird are put the colors of the air: on these the gold of the cloud, that cannot be gathered by any covetousness; the rubies of the clouds, that are not the price of Athena, but *are* Athena; the vermilion of the cloud-bar, and the flame of the cloud crest, and the snow of the cloud, and its shadow, and the melted blue of the deep wells of the sky—all these, seized by the creating spirit, and woven by Athena herself into films and threads of plume; with wave on wave following and fading along breast, and throat, and opened wings, infinite as the dividing of the foam and the sifting of the sea-sand;—even the white down of the cloud seeming to flutter up between the stronger plumes, seen, but too soft for touch.—*Athena*, p. 56.

A Bird's Beak.—I do not think it is distinctly enough felt by us that the beak of a bird is not only its mouth, but its hand, or rather its two hands. For, as its arms and hands are turned into wings, all it has to depend upon, in economical and practical life, is its beak. The beak, therefore, is at once its sword, its carpenter's tool-box, and its dressing-case; partly also its musical instrument; all this besides its function of seizing and preparing the food, in which function alone it has to be a trap, carving-knife, and teeth, all in one.—*Love's Meinie*, p. 16.

The Marriage of the Hair-brush and the Whistle.—Feathers are smoothed down, as a field

of corn by wind with rain; only the swathes laid in beautiful order. They are fur, so structurally placed as to imply, and submit to, the perpetually swift forward motion. In fact, I have no doubt the Darwinian theory on the subject is that the feathers of birds once stuck up all erect, like the bristles of a brush, and have only been blown flat by continual flying. Nay, we might even sufficiently represent the general manner of conclusion in the Darwinian system by the statement that if you fasten a hair-brush to a mill-wheel, with the handle forward, so as to develop itself into a neck by moving always in the same direction, and within continual hearing of a steam-whistle, after a certain number of revolutions the hair-brush will fall in love with the whistle; they will marry, lay an egg, and the produce will be a nightingale.—*Love's Meinie*, p. 20.

No Natural History of Birds yet written.—We have no natural history of birds written yet. It cannot be written but by a scholar and a gentleman; and no English gentleman in recent times has ever thought of birds except as flying targets, or flavorous dishes. . . . In general, the scientific natural history of a bird consists of four articles: *First*, the name and estate of the gentleman whose gamekeeper shot the last that was seen in England; *Secondly*, two or three stories of doubtful origin, printed in every book on the subject of birds for the last fifty years; *Thirdly*, an account of the feathers from the comb to the rump, with enumeration of the colors which are never more to be seen on the living bird by English eyes; and, lastly, a discussion of the reasons why none of the twelve names which former naturalists have given to the bird are of any further use, and why the present author has given it a thirteenth, which is to be universally, and to the end of time, accepted.—*Love's Meinie*, p. 7.

The Eagle.—When next you are travelling by express sixty miles an hour, past a grass bank, try

to see a grasshopper, and you will get some idea of an eagle's optical business, if it takes only the line of ground underneath it. Does it take more?—*Eagle's Nest*, p. 74.

THE ROBIN.—If you think of it, you will find one of the robin's very chief ingratiatory faculties is his dainty and delicate movement—his footing it featly here and there. Whatever prettiness there may be in his red breast, at his brightest he can always be outshone by a brickbat. But if he is rationally proud of anything about him, I should think a robin must be proud of his legs. Hundreds of birds have longer and more imposing ones, but for real neatness, finish, and precision of action, commend me to his fine little ankles, and fine little feet.—*Love's Meinie*, p. 18.

THE SWALLOW.—The bird which lives with you in your own houses, and which purifies for you, from its insect pestilence, the air that you breathe. Thus the sweet domestic thing has done, for men, at least, these four thousand years. She has been their companion, not of the home merely, but of the hearth and the threshold; companion only endeared by departure, and showing better her loving-kindness by her faithful return. Type sometimes of the stranger, she has softened us to hospitality; type always of the suppliant, she has enchanted us to mercy; and in her feeble presence, the cowardice, or the wrath, of sacrilege has changed into the fidelities of sanctuary. Herald of our summer, she glances through our days of gladness; numberer o our years, she would teach us to apply our hearts to wisdom;—and yet, so little have we regarded her, that this very day, scarcely able to gather from all I can find told of her enough to explain so much as the unfolding of her wings, I can tell you nothing of her life—nothing of her journeying. I cannot learn how she builds, nor how she chooses the place of her wandering, nor how she traces the path of her return. Remaining thus blind and careless to the true ministries of the

humble creature whom God has really sent to serve us, we in our pride, thinking ourselves surrounded by the pursuivants of the sky, can yet only invest them with majesty by giving them the calm of the bird's motion, and shade of the bird's plume:—and after all, it is well for us, if, when even for God's best mercies, and in His temples marble-built, we think that, "with angels and archangels, and all the company of Heaven, we laud and magnify His glorious name"—well for us, if our attempt be not only an insult, and His ears open rather to the inarticulate and unintended praise, of "the Swallow, twittering from her straw-built shed."—*Love's Meinie*, p, 53.

I never watch the bird for a moment without finding myself in some fresh puzzle out of which there is no clue in the scientific books. I want to know, for instance, how the bird turns. What does it do with one wing, what with the other? Fancy the pace that has to be stopped; the force of bridle-hand put out in an instant. Fancy how the wings must bend with the strain; what need there must be for the perfect aid and work of every feature in them. There is a problem for you, students of mechanics—How does a swallow turn? . . . Given the various proportions of weight and wing; the conditions of possible increase of muscular force and quill-strength in proportion to size; and the different objects and circumstances of flight—you have a series of exquisitely complex problems, and exquisitely perfect solutions, which the life of the youngest among you cannot be long enough to read through so much as once, and of which the future infinitudes of human life, however granted or extended, never will be fatigued in admiration. . . . The mystery of its dart remains always inexplicable to me; no eye can trace the bending of bow that sends that living arrow.—*Love's Meinie*, pp. 39, 43, 46.

CHAPTER II.

Botany.*

It is better to know the habits of one plant than the names of a thousand; and wiser to be happily familiar with those that grow in the nearest field, than arduously cognizant of all that plume the isles of the Pacific, or illumine the Mountains of the Moon.—*Proserpina*, p. 139.

Ruskin's Tribulations in the Study of Botany.—Balfour's *Manual of Botany*. "Sap"—yes, at last. "Article 257. Course of fluids in exogenous stems." I don't care about the course just now: I want to know where the fluids come from. "If a plant be plunged into a weak solution of acetate of lead."—I don't in the least want to know what happens. "From the minuteness of the tissue, it is not easy to determine the vessels through which the sap moves." Who said it was? If it had been easy, I should have done it myself. "Changes take place in the composition of the sap in its upward course." I dare say; but I don't know yet what its composition is before it begins going up. "The Elaborated Sap by Mr. Schultz has been called *latex*." I wish Mr. Schultz were in a hogshead of it, with the top on. "On account of these movements in the latex, the laticiferous vessels have been denominated cinenchymatous." I do not venture to print the expressions which I here mentally make use of.—*Proserpina*, p. 37.

A sudden doubt troubles me, whether all poppies have two petals smaller than the other two. Whereupon I take down an excellent little schoolbook on botany—the best I have yet found, thinking to be told quickly; and I find a great deal about opium; and, apropos of opium, that the juice of

* See also Part II., Chapter II.

common celandine is of a bright orange color; and I pause for a bewildered five minutes, wondering if a celandine is a poppy, and how many petals *it* has: going on again—because I must, without making up my mind, on either question—I am told to "observe the floral receptacle of the Californian genus Eschscholtzia." Now I can't observe anything of the sort, and I don't want to; and I wish California and all that's in it were at the deepest bottom of the Pacific. Next I am told to compare the poppy and water-lily; and I can't do that, neither—though I should like to; and there's the end of the article; and it never tells me whether one pair of petals is always smaller that the other, or not.—*Proserpina*, pp. 53, 54.

Perfume, or Essence, is the general term for the condensed dew of a vegetable vapor, which is with grace and fitness called the "being" of a plant, because its properties are almost always characteristic of the species; and it is not, like leaf tissue or wood fibre, approximately the same material in different shapes; but a separate element in each family of flowers, of a mysterious, delightful, or dangerous influence, logically inexplicable, chemically inconstructible, and wholly, in dignity of nature, above all modes and faculties of form. . . . Yet I find in the index to Dr. Lindley's *Introduction to Botany*—seven hundred pages of close print—not one of the four words "Volatile," "Essence," "Scent," or "Perfume." I examine the index to Gray's *Structural and Systematic Botany*, with precisely the same success. I next consult Professors Balfour and Grindon, and am met by the same dignified silence. Finally, I think over the possible chances in French, and try in Figuier's indices to the *Histoire des Plantes* for "Odeur"—no such word! "Parfum"—no such word! "Essence"—no such word! "Encens"—no such word! I try at last "Pois de Senteur," at a venture, and am referred to a page which describes their going to sleep. —*Proserpina*, pp. 241, 243.

BOTANIC NOMENCLATURE.—Perhaps nothing is more curious in the history of the human mind than the way in which the science of botany has become oppressed by nomenclature. Here is perhaps the first question which an intelligent child would think of asking about a tree: "Mamma, how does it make its trunk?" and you may open one botanical work after another, and good ones too, and by sensible men—you shall not find this child's question fairly put, much less fairly answered. You will be told gravely that a stem has received many names, such as *culmus*, *stipes*, and *truncus;* that twigs were once called *flagella*, but are now called *ramuli;* and that Mr. Link calls a straight stem, with branches on its sides, a *caulis excurrens;* and a stem, which at a certain distance above the earth breaks out into irregular ramifications, a *caulis deliquescens*. All thanks and honor be to Mr. Link! But at this moment, when we want to know *why* one stem breaks out "at a certain distance," and the other not at all, we find no great help in those splendid excurrencies and deliquescencies.—*Modern Painters*, V., p. 65.

On heat and force, life is inseparably dependent; and I believe, also, on a form of substance, which the philosophers call "protoplasm." I wish they would use English instead of Greek words. When I want to know why a leaf is green, they tell me it is colored by "chlorophyll," which at first sounds very instructive; but if they would only say plainly that a leaf is colored green by a thing which is called "green leaf," we should see more precisely how far we had got.—*Athena*, p. 51.

WHY IS CINNAMON AROMATIC AND SUGAR SWEET?—It is of no use to determine, by microscope or retort, that cinnamon is made of cells with so many walls, or grape-juice of molecules with so many sides;—we are just as far as ever from understanding why these particular interstices should be aromatic, and these special parallelopipeds exhilarating, as we were in the savagely unscientific days

when we could only see with our eyes, and smell with our noses.—*Proserpina*, p. 159.

THE BIOGRAPHIES OF PLANTS.—Our scientific botanists are occupied in microscopic investigations of structure which have not hitherto completely explained to us either the origin, the energy, or the course of the sap; and which, however subtle or successful, bear to the real natural history of plants only the relation that anatomy and organic chemistry bear to the history of men. . . . What we especially need at present for educational purposes is to know, not the anatomy of plants, but their biography—how and where they live and die, their tempers, benevolences, malignities, distresses, and virtues.—*Lectures on Art*, p. 70.

SAP.—At every pore of its surface, under ground and above, the plant in the spring absorbs moisture, which instantly disperses itself through its whole system "by means of some permeable quality of the membranes of the cellular tissue invisible to our eyes even by the most powerful glasses;" in this way subjected to the vital power of the tree, it becomes sap, properly so called, which passes downwards through this cellular tissue, slowly and secretly; and then upwards, through the great vessels of the tree, violently, stretching out the supple twigs of it as you see a flaccid water-pipe swell and move when the cock is turned to fill it. And the tree becomes literally a fountain, of which the springing streamlets are clothed with new-woven garments of green tissue, and of which the silver spray stays in the sky,—a spray, now, of leaves.—*Proserpina*, p. 38.

THE ROOT OF A PLANT.—The feeding function of the root is of a very delicate and discriminating kind, needing much searching and mining among the dust, to find what it wants. If it only wanted water, it could get most of that by spreading in mere soft senseless limbs, like sponge, as far, and as far down, as it could—but to get the *salt* out of the earth it has to *sift* all the earth, and taste and

touch every grain of it that it can, with fine fibres. And therefore a root is not at all a merely passive sponge or absorbing thing, but an infinitely subtle tongue, or tasting and eating thing. That is why it is always so fibrous and divided and entangled in the clinging earth.—*Proserpina*, p. 26.

THE FLOWER THE FINAL CAUSE OF THE SEED.—The Spirit in the plant—that is to say, its power of gathering dead matter out of the wreck round it, and shaping it into its own chosen shape—is of course strongest at the moment of its flowering, for it then not only gathers, but forms, with the greatest energy. . . . Only, with respect to plants, as animals, we are wrong in speaking as if the object of this strong life were only the bequeathing of itself. The flower is the end or proper object of the seed, not the seed of the flower. The reason for seeds is that flowers may be; not the reason of flowers that seeds may be. The flower itself is the creature which the spirit makes; only, in connection with its perfectness, is placed the giving birth to its successor. . . .

The main fact, then, about a flower is that it is the part of the plant's form developed at the moment of its intensest life: and this inner rapture is usually marked externally for us by the flush of one or more of the primary colors. What the character of the flower shall be, depends entirely upon the portion of the plant into which this rapture of spirit has been put. Sometimes the life is put into its outer sheath, and then the outer sheath becomes white and pure, and full of strength and grace; sometimes the life is put into the common leaves, just under the blossom, and they become scarlet or purple; sometimes the life is put into the stalks of the flower, and they flush blue; sometimes into its outer enclosure or calyx; mostly into its inner cup; but, in all cases, the presence of the strongest life is asserted by characters in which the human sight takes pleasure, and which seem prepared with distinct reference to us, or rather, bear, in being de-

lightful, evidence of having been produced by the power of the same spirit as our own.—*Athena*, p. 54.

Fruit.—I find it convenient in this volume, and wish I had thought of the expedient before, whenever I get into a difficulty, to leave the reader to work it out. He will perhaps, therefore, be so good as to define fruit for himself.—*Modern Painters*, V., p. 112.

All the most perfect fruits are developed *from exquisite forms either of foliage or flower*. The vine leaf, in its generally decorative power, is the most important, both in life and in art, of all that shade the habitations of men. The olive leaf is, without any rival, the most beautiful of the leaves of timber trees; and its blossom, though minute, of extreme beauty. The apple is essentially the fruit of the rose, and the peach of her only rival in her own color. The cherry and orange blossom are the two types of floral snow.—*Proserpina*, p. 162.

An Orange.—In the orange, the fount of fragrant juice is interposed between the seed and the husk. It is wholly independent of both; the aurantine rind, with its white lining and divided compartments, is the true husk; the orange pips are the true seeds; and the eatable part of the fruit is formed between them, in clusters of delicate little flasks, as if a fairy's store of scented wine had been laid up by her in the hollow of a chestnut shell, between the nut and rind; and then the green changed to gold.—*Proserpina*, 155.

The Poppy.—I have in my hand a small red poppy which I gathered on Whit Sunday on the palace of the Cæsars. It is an intensely simple, intensely floral, flower. All silk and flame: a scarlet cup, perfect-edged all round, seen among the wild grass far away, like a burning coal fallen from Heaven's altars. You cannot have a more complete, a more stainless, type of flower absolute; inside and outside, *all* flower. No sparing of color anywhere—no outside coarseness—no interior secrecies; open as the sunshine that creates it; fine-finished on both

sides, down to the extremest point of insertion on its narrow stalk; and robed in the purple of the Cæsars. Gather a green poppy bud, just when it shows the scarlet line at its side; break it open and unpack the poppy. The whole flower is there complete in size and color; its stamens full-grown, but all packed so closely that the fine silk of the petals is crushed into a million of shapeless wrinkles. When the flower opens, it seems a deliverance from torture: the two imprisoning green leaves are shaken to the ground; the aggrieved corolla smooths itself in the sun, and comforts itself as it can; but remains visibly crushed and hurt to the end of its days.—*Proserpina*, pp. 52, 58.

The Onion and the Garlic as Ethical Factors.—The star-group, of the squills, garlics, and onions, has always caused me great wonder. I cannot understand why its beauty, and serviceableness, should have been associated with the rank scent which has been really among the most powerful means of degrading peasant life, and separating it from that of the higher classes.—*Athena*, p. 67.

The Oat.—Here is the oat germ—after the wheat, most vital of divine gifts; and assuredly, in days to come, fated to grow on many a naked rock in hitherto lifeless lands, over which the glancing sheaves of it will shake sweet treasure of innocent gold. And who shall tell us how they grow; and the fashion of their rustling pillars—bent, and again erect, at every breeze. Fluted shaft or clustered pier, how poor of art, beside this grass-shaft—built, first to sustain the food of men, then to be strewn under their feet!—*Proserpina*, p. 106.

The Martyr Moss.—You remember, I doubt not, how often in gathering what most invited gathering, of deep green, starry, perfectly soft and living wood-moss, you found it fall asunder in your hand into multitudes of separate threads, each with its bright green crest, and long root of blackness. That blackness at the root—though only so notable

in this wood-moss and collateral species, is indeed a general character of the mosses, with rare exceptions. It is their funeral blackness;—that, I perceive, is the way the moss-leaves die. They do not fall—they do not visibly decay. But they decay *in*visibly, in continual secession, beneath the ascending crest. They rise to form that crest, all green and bright, and take the light and air from those out of which they grew; and those, their ancestors, darken and die slowly, and at last become a mass of mouldering ground. In fact, as I perceive farther, their final duty is so to die. The main work of other leaves is in their life—but these have to form the earth out of which all other leaves are to grow. Not to cover the rocks with golden velvet only, but to fill their crannies with the dark earth, through which nobler creatures shall one day seek their being.—*Proserpina*, p. 17.

Leaves ribbed and undulated.—When a leaf is to be spread wide, like the burdock, it is supported by a framework of extending ribs like a Gothic roof. The supporting function of these is geometrical; every one is constructed like the girders of a bridge, or beams of a floor, with all manner of science in the distribution of their substance in the section, for narrow and deep strength; and the shafts are mostly hollow. But when the extending space of a leaf is to be enriched with fulness of folds, and become beautiful in wrinkles, this may be done either by pure undulation as of a liquid current along the leaf edge, or by sharp "drawing"—or "gathering" I believe ladies would call it—and stitching of the edges together. And this stitching together, if to be done very strongly, is done round a bit of stick, as a sail is reefed round a mast; and this bit of stick needs to be compactly, not geometrically strong; its function is essentially that of starch—not to hold the leaf up off the ground against gravity; but to stick the edges out, stiffly, in a crimped frill. And in beautiful work of this kind, which we are meant to study, the stays

of the leaf—or stay-bones—are finished off very sharply and exquisitely at the points; and indeed so much so, that they prick our fingers when we touch them; for they are not at all meant to be touched, but admired.—*Proserpina*, pp. 80, 81.

CHAPTER III.

Minerals.

Crystals.—The crystalline power is essentially a styptic power, and wherever the earth is torn, it heals and binds; nay, the torture and grieving of the earth seem necessary to bring out its full energy; for you only find the crystalline living power fully in action, where the rents and faults are deep and many.—*Ethics of the Dust*, p. 114.

The mineral crystals group themselves neither in succession, nor in sympathy; but great and small recklessly strive for place, and deface or distort each other as they gather into opponent asperities. The confused crowd fills the rock cavity, hanging together in a glittering, yet sordid heap, in which nearly every crystal, owing to their vain contention, is imperfect, or impure. Here and there one, at the cost and in defiance of the rest, rises into unwarped shape or unstained clearness.—*Modern Painters*, V., p. 48.

The goodness of crystals consists chiefly in purity of substance, and perfectness of form: but those are rather the *effects* of their goodness, than the goodness itself. The inherent virtues of the crystals, resulting in these outer conditions, might really seem to be best described in the words we should use respecting living creatures—"force of heart" and "steadiness of purpose." There seem to be in some crystals, from the beginning, an unconquerable purity of vital power, and strength of crystal spirit. Whatever dead substance, unacceptant of this energy, comes in their way, is either

rejected, or forced to take some beautiful subordinate form ; the purity of the crystal remains unsullied, and every atom of it bright with coherent energy.

Then the second condition is, that from the beginning of its whole structure, a fine crystal seems to have determined that it will be of a certain size and of a certain shape ; it persists in this plan, and completes it. Here is a perfect crystal of quartz for you. It is of an unusual form, and one which it might seem very difficult to build—a pyramid with convex sides, composed of other minor pyramids. But there is not a flaw in its contour throughout; not one of its myriads of component sides but is as bright as a jeweller's facetted work (and far finer, if you saw it close). The crystal points are as sharp as javelins ; their edges will cut glass with a touch. Anything more resolute, consummate, determinate in form, cannot be conceived. Here, on the other hand, is a crystal of the same substance, in a perfectly simple type of form—a plain six sided prism ; but from its base to its point,—and it is nine inches long,—it has never for one instant made up its mind what thickness it will have. It seems to have begun by making itself as thick as it thought possible with the quantity of material at command. Still not being as thick as it would like to be, it has clumsily glued on more substance at one of its sides. Then it has thinned itself, in a panic of economy; then puffed itself out again ; then starved one side to enlarge another ; then warped itself quite out of its first line. Opaque, rough-surfaced, jagged on the edge, distorted in the spine, it exhibits a quite human image of decrepitude and dishonor ; but the worst of all the signs of its decay and helplessness, is that half-way up, a parasite crystal, smaller, but just as sickly, has rooted itself in the side of the larger one, eating out a cavity round its root, and then growing backwards, or downwards, contrary to the direction of the main crystal. Yet I cannot trace the least difference in purity of substance between the first

most noble stone, and this ignoble and dissolute one. The impurity of the last is in its will, or want of will.—*Ethics of the Dust*, p. 58.

THE MARBLES.—The soft white sediments of the sea draw themselves, in process of time, into smooth knots of sphered symmetry; burdened and strained under increase of pressure, they pass into a nascent marble; scorched by fervent heat, they brighten and blanch into the snowy rock of Paros and Carrara.—*Ethics of the Dust*, p. 140.

These stones, which men have been cutting into slabs, for thousands of years, to ornament their principal buildings with,—and which, under the general name of "marble," have been the delight of the eyes, and the wealth of architecture, among all civilized nations—are precisely those on which the signs and brands of these earth-agonies have been chiefly struck; and there is not a purple vein nor flaming zone in them, which is not the record of their ancient torture.—*Ethics of the Dust*, p. 116.

The substance appears to have been prepared expressly in order to afford to human art a perfect means of carrying out its purposes. They are of exactly the necessary hardness—neither so soft as to be incapable of maintaining themselves in delicate forms, nor so hard as always to require a blow to give effect to the sculptor's touch; the mere pressure of his chisel produces a certain effect upon them. The color of the white varieties is of exquisite delicacy, owing to the partial translucency of the pure rock; and it has always appeared to me a most wonderful ordinance—one of the most *marked* pieces of purpose in the creation—that all the variegated kinds should be comparatively opaque, so as to set off the color on the surface, while the white, which if it had been opaque would have looked somewhat coarse (as, for instance, common chalk does), is rendered just translucent enough to give an impression of extreme purity, but not so translucent as to interfere in the least

with the distinctness of any forms into which it is wrought.

The colors of variegated marbles are also for the most part very beautiful, especially those composed of purple, amber, and green, with white; and there seems to be something notably attractive to the human mind in the vague and veined labyrinths of their arrangements. They are farther marked as the prepared material for human work by the dependence of their beauty on smoothness of surface; for their veins are usually seen but dimly in the native rock; and the colors they assume under the action of weather are inferior to those of the crystallines: it is not until wrought and polished by man that they show their character. Finally, they do not decompose. The exterior surface is sometimes destroyed by a sort of mechanical disruption of its outer flakes, but rarely to the extent in which such action takes place in other rocks; and the most delicate sculptures, if executed in good marble, will remain for ages undeteriorated.—*Modern Painters*, IV., p. 141.

Minerals and Minerals.—When I was a boy I used to care about pretty stones. I got some Bristol diamonds at Bristol, and some dog-tooth spar in Derbyshire; my whole collection had cost perhaps three half-crowns, and was worth considerably less; and I knew nothing whatever, rightly, about any single stone in it;—could not even spell their names: but words cannot tell the joy they used to give me. Now, I have a collection of minerals worth, perhaps, from two to three thousand pounds; and I know more about some of them than most other people. But I am not a whit happier, either for my knowledge, or possessions, for other geologists dispute my theories, to my grievous indignation and discontentment; and I am miserable about all my best specimens, because there are better in the British Museum.—*Fors Clavigera.*

The Colors of Clay, Lime, and Flint.—Nature seems to have set herself to make these three sub-

stances as interesting to us, and as beautiful for us, as she can. The clay, being a soft and changeable substance, she doesn't take much pains about, as we have seen, till it is baked; she brings the color into it only when it receives a permanent form. But the limestone and flint she paints, in her own way, in their native state: and her object in painting them seems to be much the same as in her painting of flowers; to draw us, careless and idle human creatures, to watch her a little, and see what she is about—that being on the whole good for us, her children. For Nature is always carrying on very strange work with this limestone and flint of hers: laying down beds of them at the bottom of the sea; building islands out of the sea; filling chinks and veins in mountains with curious treasures; petrifying mosses, and trees, and shells; in fact, carrying on all sorts of business, subterranean or submarine, which it would be highly desirable for us, who profit and live by it, to notice as it goes on. And apparently to lead us to do this, she makes picture-books for us of limestone and flint; and tempts us, like foolish children as we are, to read her books by the pretty colors in them. The pretty colors in her limestone-books form those variegated marbles which all mankind have taken delight to polish and build with from the beginning of time; and the pretty colors in her flint-books form those agates, jaspers, cornelians, bloodstones, onyxes, cairngorms, chrysoprases, which men have in like manner taken delight to cut, and polish, and make ornaments of, from the beginning of time; and yet, so much of babies are they, and so fond of looking at the pictures instead of reading the book, that I question whether, after six thousand years of cutting and polishing there are above two or three people out of any given hundred, who know, or care to know, how a bit of agate or a bit of marble was made, or painted.

How it was made, may not be always very easy to say; but with what it was painted there is no manner of question. All those beautiful violet veinings

and variegations of the marbles of Sicily and Spain, the glowing orange and amber colors of those of Siena, the deep russet of the *Rosso antico*, and the blood-color of all the precious jaspers that enrich the temples of Italy; and, finally, all the lovely transitions of tint in the pebbles of Scotland and the Rhine, which form, though not the most precious, by far the most interesting portion of our modern jewellers' work;—all these are painted by nature with this one material only, variously proportioned and applied—the oxide of iron that stains your Tunbridge springs.—*The Two Paths*, p. 110.

COMPETITION *vs.* CO-OPERATION.—Exclusive of animal decay, we can hardly arrive at a more absolute type of impurity, than the mud or slime of a damp, over-trodden path, in the outskirts of a manufacturing town. I do not say mud of the road, because that is mixed with animal refuse; but take merely an ounce or two of the blackest slime of a beaten footpath, on a rainy day, near a manufacturing town. That slime we shall find in most cases composed of clay (or brickdust, which is burnt clay), mixed with soot, a little sand and water. All these elements are at helpless war with each other, and destroy reciprocally each other's nature and power: competing and fighting for place at every tread of your foot; sand squeezing out clay, and clay squeezing out water, and soot meddling everywhere, and defiling the whole. Let us suppose that this ounce of mud is left in perfect rest, and that its elements gather together, like to like, so that their atoms may get into the closest relations possible.

Let the clay begin. Ridding itself of all foreign substance, it gradually becomes a white earth, already very beautiful, and fit with help of congealing fire, to be made into finest porcelain, and painted on, and be kept in kings' palaces. But such artificial consistence is not its best. Leave it still quiet, to follow its own instinct of unity, and it becomes, not only white but clear; not only

clear, but hard; not only clear and hard, but so set that it can deal with light in a wonderful way, and gather out of it the loveliest blue rays only, refusing the rest. We call it then a sapphire.

Such being the consummation of the clay, we give similar permission of quiet to the sand. It also becomes, first, a white earth; then proceeds to grow clear and hard, and at last arranges itself in mysterious, infinitely fine parallel lines, which have the power of reflecting, not merely the blue rays, but the blue, green, purple, and red rays, in the greatest beauty in which they can be seen through any hard material whatsoever. We call it then an opal.

In next order the soot sets to work. It cannot make itself white at first; but, instead of being discouraged, tries harder and harder; and comes out clear at last; and the hardest thing in the world: and for the blackness that it had, obtains in exchange the power of reflecting all the rays of the sun at once, in the vividest blaze that any solid thing can shoot. We call it then a diamond.

Last of all, the water purifies, or unites itself; contented enough if it only reach the form of a dewdrop; but if we insist on its proceeding to a more perfect consistence, it crystallizes into the shape of a star. And, for the ounce of slime which we had by political economy of competition, we have, by political economy of co-operation, a sapphire, an opal, and a diamond, set in the midst of a star of snow.—*Modern Painters*, V., pp. 176, 177.

CHAPTER IV.

Clouds.

All clouds are so opaque that, however delicate they may be, you never see one through another. Six feet depth of them, at a little distance, will wholly veil the darkest mountain edge. . . . And this opacity is, nevertheless, obtained without

destroying the gift they have of letting broken light through them, so that, between us and the sun, they may become golden fleeces, and float as fields of light.—*Modern Painters*, V., pp. 137, 138.

All lovely clouds, remember, are *quiet* clouds—not merely quiet in appearance, because of their greater height and distance, but quiet actually, fixed for hours, it may be, in the same form and place. I have seen a fair-weather cloud high over Coniston Old Man—not *on* the hill, observe, but a vertical mile above it—stand motionless, changeless, for twelve hours together. From four o'clock in the afternoon of one day I watched it through the night by the north twilight, till the dawn struck it with full crimson, at four of the following July morning.—*Art of England*, p. 105.

Outlining a Cloud.—How is a cloud outlined? Granted whatever you choose to ask, concerning its material, or its aspect, its loftiness and luminousness—how of its limitation? What hews it into a heap, or spins it into a web? Cold, it is usually shapeless, I suppose, extending over large spaces equally, or with gradual diminution. You cannot have in the open air, angles, and wedges, and coils, and cliffs, of cold. Yet the vapor stops suddenly, sharp and steep as a rock, or thrusts itself across the gates of heaven in likeness of a brazen bar; or braids itself in and out, and across and across, like a tissue of tapestry; or falls into ripples, like sand; or into waving shreds and tongues, as fire. On what anvils and wheels is the vapor pointed, twisted, hammered, whirled, as the potter's clay? By what hands is the incense of the sea built up into domes of marble?—*Modern Painters*, V., p. 124.

Cloud Lustres.—The gilding to our eyes of a burnished cloud depends, I believe, at least for a measure of its lustre, upon the angle at which the rays incident upon it are reflected to the eye, just as much as the glittering of the sea beneath it—or the sparkling of the windows of the houses on the shore.—*Storm Cloud*, Lect. II.

ATTACHED CLOUDS.—The opposed conditions of the higher and lower orders of cloud, with the balanced intermediate one, are beautifully seen on mountain summits of rock or earth. On snowy ones they are far more complex: but on rock summits there are three distinct forms of attached cloud in serene weather; the first that of cloud veil laid over them, and *falling* in folds through their ravines (the obliquely descending clouds of the entering chorus in Aristophanes); secondly, the ascending cloud, which develops itself loosely and independently as it rises, and does not attach itself to the hillside, while the falling veil cloud clings to it close all the way down;—and lastly the throned cloud, which rests indeed on the mountain summit, with its base, but rises high above into the sky, continually changing its outlines, but holding its seat perhaps all day long.—*Storm Cloud*, Lect. II.

CIRRUS CLOUDS.—Their chief characters are—*First*, Symmetry: They are nearly always arranged in some definite and evident order, commonly in long ranks reaching sometimes from the zenith to the horizon, each rank composed of an infinite number of transverse bars of about the same length, each bar thickest in the middle, and terminating in a traceless vaporous point at each side; the ranks are in the direction of the wind, and the bars of course at right angles to it; these latter are commonly slightly bent in the middle.—*Secondly*, Sharpness of Edge: The edges of the bars of the upper clouds which are turned to the wind, are often the sharpest which the sky shows; no outline whatever of any other kind of cloud, however marked and energetic, ever approaches the delicate decision of these edges.—*Thirdly*, Multitude: The delicacy of these vapors is sometimes carried into such an infinity of division, that no other sensation of number that the earth or heaven can give is so impressive.—*Fourthly*, Purity of Color: They are composed of the purest aqueous vapor, free from all foulness of earthly gases, and of this in the lightest

and most ethereal state in which it can be, to be visible. . . . Their colors are more pure and vivid, and their white less sullied than those of any other clouds.—*Lastly*, Variety: Variety is never so conspicuous, as when it is united with symmetry. The perpetual change of form in other clouds, is monotonous in its very dissimilarity, nor is difference striking where no connection is implied; but if through a range of barred clouds, crossing half the heaven, all governed by the same forces and falling into one general form, there be yet a marked and evident dissimilarity between each member of the great mass—one more finely drawn, the next more delicately moulded, the next more gracefully bent—each broken into differently modelled and variously numbered groups, the variety is doubly striking, because contrasted with the perfect symmetry of which it forms a part.—*Modern Painters*, I., pp. 290–293.

THE STORM-CLOUD OF THE NINETEENTH CENTURY.—The first time I recognized the clouds brought by the plague-wind as distinct in character was in walking back from Oxford, after a hard day's work, to Abingdon, in the early spring of 1871. It would take too long to give you any account this evening of the particulars which drew my attention to them; but during the following months I had too frequent opportunities of verifying my first thoughts of them, and on the first of July in that year wrote the description of them which begins the *Fors Clavigera* of August, thus:—

"It is the first of July, and I sit down to write by the dismalest light that ever yet I wrote by; namely, the light of this mid-summer morning, in mid-England (Matlock, Derbyshire), in the year 1871. For the sky is covered with grey clouds;—not rain-cloud, but a dry black veil, which no ray of sunshine can pierce; partly diffused in mist, feeble mist, enough to make distant objects unintelligible, yet without any substance, or wreathing, or color of its own. And everywhere the leaves of the trees are shaking fitfully, as they do before a thunder-

storm; only not violently, but enough to show the passing to and fro of a strange, bitter, blighting wind. Dismal enough, had it been the first morning of its kind that summer had sent. But during all this spring, in London, and at Oxford, through meagre March, through changelessly sullen April, through despondent May, and darkened June, morning after morning has come grey-shrouded thus.

"And it is a new thing to me, and a very dreadful one. I am fifty years old, and more; and since I was five, have gleaned the best hours of my life in the sun of spring and summer mornings; and I never saw such as these, till now. And the scientific men are busy as ants, examining the sun, and the moon, and the seven stars, and can tell me all about *them*, I believe, by this time; and how they move, and what they are made of.

"And I do not care, for my part, two copper spangles how they move, nor what they are made of. I can't move them any other way than they go, nor make them of anything else, better than they are made. But I would care much and give much, if I could be told where this bitter wind comes from, and what *it* is made of. For, perhaps, with forethought, and fine laboratory science, one might make it of something else.

"It looks partly as if it were made of poisonous smoke; very possibly it may be: there are at least two hundred furnace chimneys in a square of two miles on every side of me. But mere smoke would not blow to and fro in that wild way. It looks more to me as if it were made of dead men's souls—such of them as are not gone yet where they have to go, and may be flitting hither and thither, doubting, themselves, of the fittest place for them. . . ."

Since that Midsummer day, my attention, however otherwise occupied, has never relaxed in its record of the phenomena characteristic of the plague-wind; and I now define for you, as briefly as possible, the essential signs of it:

1. It is a wind of darkness:—all the former condi-

tions of tormenting winds, whether from the north or east, were more or less capable of co-existing with sunlight, and often with steady and bright sunlight; but whenever, and wherever the plague-wind blows, be it but for ten minutes, the sky is darkened instantly.—2. It is a malignant *quality* of wind unconnected with any one quarter of the compass; it blows indifferently from all, attaching its own bitterness and malice to the worst characters of the proper winds of each quarter. It will blow either with drenching rain, or dry rage, from the south—with ruinous blasts from the west—with bitterest chills from the north—and with venomous blight from the east. Its own favorite quarter, however, is the south-west, so that it is distinguished in its malignity equally from the Bise of Provence, which is a north wind always, and from our own old friend, the east.—3. It always blows *tremulously*, making the leaves of the trees shudder as if they were all aspens, but with a peculiar fitfulness which gives them—and I watch them this moment as I write—an expression of anger as well as of fear and distress. You may see the kind of quivering, and hear the ominous whimpering, in the gusts that precede a great thunder-storm; but plague-wind is more panic-struck, and feverish; and its sound is a hiss instead of a wail.—4. Not only tremulous at every moment, it is also *intermittent* with a rapidity quite unexampled in former weather. There are, indeed, days—and weeks, on which it blows without cessation, and is as inevitable as the Gulf Stream; but also there are days when it is contending with healthy weather, and on such days it will remit for half an hour, and the sun will begin to show itself, and then the wind will come back and cover the whole sky with clouds in ten minutes; and so on every half-hour, through the whole day; so that it is often impossible to go on with any kind of drawing in color, the light being never for two seconds the same from morning till evening.—5. It degrades, while it intensifies, ordinary storm.

Take the following sequences of accurate description of thunderstorm, with plague-wind:

"*June* 22, 1876.—Thunderstorm; pitch dark, with no *blackness*—but deep, high, *filthiness* of lurid, yet not sublimely lurid, smoke-cloud; dense manufacturing mist; fearful squalls of shivery wind, making Mr. Severn's sail quiver like a man in a fever-fit—all about four, afternoon—but only two or three claps of thunder, and feeble, though near, flashes. I never saw such a dirty, weak, foul storm. It cleared suddenly, after raining all afternoon, at half-past eight to nine, into pure, natural weather, —low rain-clouds on quite clear, green, wet hills.

"*August* 13, 1879.—Quarter to eight, morning.—Thunder returned, all the air collapsed into one black fog, the hills invisible, and scarcely visible the opposite shore; heavy rain in short fits, and frequent, though less formidable, flashes, and shorter thunder. While I have written this sentence the cloud has again dissolved itself, like a nasty solution in a bottle, with miraculous and unnatural rapidity, and the hills are in sight again. Half-past eight.—Three times light and three times dark since last I wrote, and the darkness seeming each time as it settles more loathsome, at last stopping my reading in mere blindness. One lurid gleam of white cumulus in upper lead-blue sky, seen for half a minute through the sulphuro s chimney-pot vomit of blackguardly cloud beneath, where its rags were thinnest.

"*August* 17, 1879.—Raining in foul drizzle, slow and steady; sky pitch-dark, and I just got a little light by sitting in the bow-window; diabolic clouds over everything: and looking over my kitchen garden yesterday, I found it one miserable mass of weeds gone to seed, the roses in the higher garden putrefied into brown sponges, feeling like dead snails; and the half-ripe strawberries all rotten at the stalks."

"*February* 22, 1883.—Yesterday a fearfully dark mist all afternoon, with steady, south plague-wind of the bitterest, nastiest, poisonous blight, and fretful flutter. I could scarcely stay in the wood for the horror of it. To-day, really rather bright blue, and bright semi-cumuli, with the frantic Old Man blowing sheaves of lancets and chisels across the lake—not in strength enough, or whirl enough, to

raise it in spray, but tracing every squall's outline in black on the silvery grey waves, and whistling meanly, and as if on a flute made of a file.

6. And now I come to the most important sign of the plague-wind and the plague-cloud: that in bringing on their peculiar darkness, they *blanch* the sun instead of reddening it. . . . I should have liked to have blotted down for you a bit of plague-cloud; but Heaven knows, you can see enough of it nowadays without any trouble of mine; and if you want, in a hurry, to see what the sun looks like through it, you've only to throw a bad half-crown into a basin of soap and water.—*Storm-Cloud*, Lect. I., pp. 26–35.

CHAPTER V.

Bits of Thought.

Ruskin's First Piece of Published Writing. —I do not think the causes of the color of transparent water have been sufficiently ascertained. I do not mean that effect of color which is simply optical, as the color of the sea, which is regulated by the sky above, or the state of the atmosphere; but I mean the settled color of transparent water, which has, when analyzed, been found pure. Now, copper will tinge water green, and that very strongly; but water thus impregnated will not be transparent, and will deposit the copper it holds in solution upon any piece of iron which may be thrown into it. There is a lake in a defile on the north-west flank of Snowdon, which is supplied by a stream, which previously passes over several veins of copper: this lake is, of course, of a bright verdigrise green, but it is not transparent. Now, the coloring effect of which I speak, is well seen in the waters of the Rhone and Rhine. The former of these rivers, when it enters the Lake of Geneva, after having received the torrents descending from

the mountains of the Valais, is fouled with mud, or white with the calcareous matter which it holds in solution. Having deposited this in the Lake Leman (thereby forming an immense delta), it issues from the lake perfectly pure, and flows through the streets of Geneva so transparent, that the bottom can be seen 20 feet below the surface, yet so blue, that you might imagine it to be a solution of indigo. In like manner, the Rhine, after purifying itself in the Lake of Constance, flows forth, colored of a clear green ; and this under all circumstances, and in all weathers. It is sometimes said that this arises from the torrents which supply these rivers generally flowing from the glaciers, the green and blue color of which may have given rise to this opinion; but the color of the ice is purely optical, as the fragments detached from the mass appear simply white. Perhaps some correspondent can afford me some information on the subject.—*Magazine of Natural History*, 1834.

Envy among Scientific Men.—The retardation of science by envy is one of the most tremendous losses in the economy of the present century.—*Unto this Last*, p. 51.

Ruskin's Opinion of Modern Science, written in 1853.—That modern science, with all its additions to the comforts of life, and to the fields of rational contemplation, has placed the existing races of mankind on a higher platform than any that preceded them, none can doubt for an instant ; and I believe the position in which we find ourselves is somewhat analogous to that of thoughtful and laborious youth succeeding a restless and heedless infancy.—*Stones of Venice*, III., p. 166.

Pure Scientific Research never Rewarded. —My ingenious friends, science has no more to do with making steam-engines than with making breeches ; though she condescends to help you a little in such necessary (or it may be, conceivably, in both cases, sometimes unnecessary) businesses.

Science lives only in quiet places, and with odd people, mostly poor. . . .

You cannot be simple enough, even in April, to think I got my three thousand pounds worth of minerals by studying mineralogy? Not so; they were earned for me by hard labor; my father's in England, and many a sunburnt vineyard-dresser's in Spain.—*Fors*, I., p. 44.

We are glad enough, indeed, to make our profit of science; we snap up anything in the way of a scientific bone that has meat on it, eagerly enough; but if the scientific man comes for a bone or a crust to *us*, that is another story.—*Sesame and Lilies*, p. 56.

THE VIBRATIONS OF THE TYMPANUM.—It is quite true that the tympanum of the ear vibrates under sound, and that the surface of the water in a ditch vibrates too: but the ditch hears nothing for all that; and my hearing is still to me as blessed a mystery as ever, and the interval between the ditch and me, quite as great. If the trembling sound in my ears was once of the marriage-bell which began my happiness and is now of the passing-bell which ends it, the difference between those two sounds to me cannot be counted by the number of concussions.—*Athena*, p. 50.

THE STUDY OF NATURAL HISTORY.—For one man who is fitted for the study of words, fifty are fitted for the study of things, and were intended to have a perpetual, simple, and religious delight in watching the processes, or admiring the creatures, of the natural universe. Deprived of this source of pleasure, nothing is left to them but ambition or dissipation; and the vices of the upper classes of Europe are, I believe, chiefly to be attributed to this single cause. —*Stones of Venice*, III., p. 216.

ONLY SIMPLE TOOLS NEEDED.—A quick eye, a candid mind, and an earnest heart, are all the microscopes and laboratories which any of us need; and with a little clay, sand, salt, and sugar, a man may find out more of the methods of geological phe-

nomenon than ever were known to Sir Charles Lyell.—*In Montibus Sanctis*, p. 25.

NONDESCRIPT SPECIES OF ANIMALS.—Between the gentes, or races of animals, and between the species, or families, there are invariably links—mongrel creatures, neither one thing nor another—but clumsy, blundering, hobbling, misshapen things. You are always thankful when you see one that you are not *it*. They are, according to old philosophy, in no process of development up or down, but are necessary, though much pitiable, where they are. Thus between the eagle and the trout, the mongrel or needful link is the penguin. Well, if you ever saw an eagle or a windhover flying, I am sure you must have sometimes wished to be a windhover; and if ever you saw a trout or a dolphin swimming, I am sure, if it was a hot day, you wished you could be a trout. But did ever anybody wish to be a penguin?—*Deucalion*, p. 182.

WOULD PEEP AND BOTANIZE UPON THEIR MOTHER'S GRAVE.—Men who have the habit of clustering and harmonizing their thoughts are a little too apt to look scornfully upon the harder workers who tear the bouquet to pieces to examine the stems. This was the chief narrowness of Wordsworth's mind; he could not understand that to break a rock with a hammer in search of crystal may sometimes be an act not disgraceful to human nature, and that to dissect a flower may sometimes be as proper as to dream over it; whereas all experience goes to teach us, that among men of average intellect the most useful members of society are the dissectors, not the dreamers.—*Modern Painters*, III., p. 309.

THE SPECTRUM OF BLOOD.—My friend showed me the rainbow of the rose, and the rainbow of the violet, and the rainbow of the hyacinth, and the rainbow of forest leaves being born, and the rainbow of forest leaves dying.

And, last, he showed me the rainbow of blood. It was but the three hundredth part of a grain, dissolved in a drop of water: and it cast its measured

bars, forever recognizable now to human sight, on the chord of the seven colors. And no drop of that red rain can now be shed, so small as that the stain of it cannot be known, and the voice of it heard out of the ground.—*Time and Tide*, p. 110.

Modern Scientific Knowledge an Asses' Bridge.—The fact is that the greater quantity of the knowledge which modern science is so saucy about, is only an asses' bridge, which the asses all stop at the top of, and which, moreover, they can't help stopping at the top of; for they have from the beginning taken the wrong road, and so come to a broken bridge—a *Ponte rotto* over the River of Death, by which the Pontifex Maximus allows them to pass no step farther.

For instance—having invented telescopes and photography, you are all stuck up on your hobby-horses, because you know how big the moon is, and can get pictures of the volcanoes in it! But you never can get any more than *pictures* of these, while in your own planet there are a thousand volcanoes which you may jump into, if you have a mind to; and may one day perhaps be blown sky high by, whether you have a mind or not. The last time the great volcano in Java was in eruption, it threw out a stream of hot water as big as Lancaster Bay, and boiled twelve thousand people. That's what I call a volcano to be interested about, if you want sensational science.

But if not, and you can be content in the wonder and the power of Nature, without her terror,—here is a little bit of a volcano, close at your very doors—Yewdale Crag, which I think will be quiet for our time; and on which the *Anagallis tenella*, and the golden potentilla, and the sun-dew grow together among the dewy moss in peace. And on the cellular surface of one of the blocks of it, you may find more beauty, and learn more precious things, than with telescope or photograph from all the moons in the milky way, though every drop of it were another solar system.—*Deucalion*, pp. 142, 143.

MR. DARWIN'S ACCOUNT OF THE PEACOCK'S FEATHER.—I went to it myself, hoping to learn some of the existing laws of life which regulate the local disposition of the color. But none of these appear to be known; and I am informed only that peacocks have grown to be peacocks out of brown pheasants, because the young feminine brown pheasants like fine feathers. Whereupon I say to myself, "Then either there was a distinct species of brown pheasants originally born with a taste for fine feathers; and therefore with remarkable eyes in their heads,—which would be a much more wonderful distinction of species than being born with remarkable eyes in their tails,—or else all pheasants would have been peacocks by this time!" And I trouble myself no more about the Darwinian theory.—*Eagle's Nest*, p. 112.

SCIENCE AND SONG.—You have, I doubt not, your new science of song, as of nest-building: and I am happy to think you could all explain to me, or at least you will be able to do so before you pass your natural science examination, how, by the accurate connection of a larynx with a bill, and by the action of heat, originally derived from the sun, upon the muscular fibre, an undulatory motion is produced in the larynx, and an opening and shutting one in the bill, which is accompanied, necessarily, by a piping sound.—*Eagle's Nest*, p. 41.

THERE ARE SCIENCES OF THE ARTS, TOO.—It has become the permitted fashion among modern mathematicians, chemists, and apothecaries, to call themselves "scientific men," as opposed to theologians, poets, and artists. They know their sphere to be a separate one; but their ridiculous notion of its being a peculiarly scientific one ought not to be allowed in our Universities. There is a science of Morals, a science of History, a science of Grammar, a science of Music, and a science of Painting; and all these are quite beyond comparison higher fields for human intellect, and require accuracies of intenser

observation, than either chemistry, electricity, or geology.—*Ariadne*, p. 85.

THE CULT OF UGLINESS.—And the universal instinct of blasphemy in the modern vulgar scientific mind is above all manifested in its love of what is ugly, and natural enthralment by the abominable; —so that it is ten to one if, in the description of a new bird, you learn much more of it than the enumerated species of vermin that stick to its feathers; and in the natural history museum of Oxford, humanity has been hitherto taught, not by portraits of great men, but by the skulls of cretins.—*Storm Cloud*, Lect. II., § 20.

SCIENCE *vs.* ART.—"It is very fine," sculptors and painters say, "and very useful, this knocking the light out of the sun, or into it, by an eternal cataract of planets. But you may hail away, so, for ever, and you will not knock out what we can. Here is a bit of silver, not the size of half-a-crown, on which, with a single hammer stroke, one of us, two thousand and odd years ago, hit out the head of the Apollo of Clazomenæ. It is merely a matter of form; but if any of you philosophers, with your whole planetary system to hammer with, can hit out such another bit of silver as this,—we will take off our hats to you. For the present, we keep them on."—*Ethics of the Dust*, p. 127.

RIVERS NOT DEEPENING BUT FILLING UP THEIR BEDS.—Niagara is a vast Exception—and Deception. The true cataracts and falls of the great mountains, as the dear little cascades and leaplets of your own rills, fall where they fell of old;—that is to say, wherever there's a hard bed of rock for them to jump over. They don't cut it away—and they can't. They do form pools *beneath* in a mystic way,—they excavate them to the depth which will break their fall's force—and then they excavate no more.—*Deucalion*, p. 136.

DECAY IN THE SCALE OF ANIMATED LIFE.—The decomposition of a crystal is not necessarily impure at all. The fermentation of a wholesome liquid be-

gins to admit the idea slightly ; the decay of leaves yet more; of flowers, more; of animals, with greater painfulness and terribleness in exact proportion to their original vitality ; and the foulest of all corruption is that of the body of man ; and, in his body, that which is occasioned by disease, more than that of natural death.—*Modern Painters*, V., p. 174.

GEOLOGY.—Though an old member of the Geological Society, my geological observations have always been as completely ignored by that society as my remarks on political economy by the directors of the Bank of England.—*In Montibus Sanctis.*

I do not believe that one in a hundred of our youth, or of our educated classes, out of directly scientific circles, take any real interest in geology. And for my own part, I do not wonder,—for it seems to me that geology tells us nothing really interesting. It tells us much about a world that once was. But, for my part, a world that only was, is as little interesting as a world that only is to be. I no more care to hear of the forms of mountains that crumbled away a million of years ago to leave room for the town of Kendal, than of forms of mountains that some future day may swallow up the town of Kendal in the cracks of them. I am only interested—so ignoble and unspeculative is my disposition—in knowing how God made the Castle Hill of Kendal, for the Baron of it to build on, and how he brought the Kent through the dale of it, for its people and flocks to drink of.

And these things, if you think of them, you will find are precisely what the geologists cannot tell you. They never trouble themselves about matters so recent, or so visible ; and while you may always obtain the most satisfactory information from them respecting the congelation of the whole globe out of gas, or the direction of it in space, there is really not one who can explain to you the making of a pebble, or the running of a rivulet.—*Deucalion*, p. 127.

There are, broadly, three great demonstrable periods of the Earth's history: That in which it was crystallized; that in which it was sculptured; and that in which it is now being unsculptured, or deformed. These three periods interlace with each other, and gradate into each other—as the periods of human life do. Something dies in the child on the day that it is born—something is born in the man on the day that he dies: nevertheless, his life is broadly divided into youth, strength, and decrepitude. In such clear sense, the Earth has its three ages: of their length we know as yet nothing, except that it has been greater than any man had imagined.

The First Period.—But there was a period, or a succession of periods, during which the rocks which are now hard were soft; and in which, out of entirely different positions, and under entirely different conditions from any now existing or describable, the masses, of which the mountains you now see are made, were lifted and hardened, in the positions they now occupy, though in what forms we can now no more guess than we can the original outline of the block from the existing statue.

The Second Period.—Then, out of those raised masses, more or less in lines compliant with their crystalline structure, the mountains we now see were hewn, or worn, during the second period, by forces for the most part differing both in mode and violence from any now in operation, but the result of which was to bring the surface of the earth into a form approximately that which it has possessed as far as the records of human history extend.—The Ararat of Moses's time, the Olympus and Ida of Homer's, are practically the same mountains now, that they were then.

The Third Period.—Not, however, without some calculable, though superficial, change, and that change, one of steady degradation. For in the third, or historical period, the valleys excavated in the second period, are being filled up, and the mountains hewn in the second period, worn or ruined down. In the second era the valley of the Rhone

was being cut deeper every day; now it is every day being filled up with gravel. In the second era, the scars of Derbyshire and Yorkshire were cut white and steep; now they are being darkened by vegetation, and crumbled by frost. You cannot, I repeat, separate the periods with precision; but, in their characters, they are as distinct as youth from age. —*Deucalion*, pp. 22, 23.

THE DISCOVERY BY JAMES FORBES OF THE VISCOUS NATURE OF GLACIER ICE.—Professor Agassiz, of Neuchâtel, had then [1841] been some eight or ten years at work on the glaciers: had built a cabin on one of them; walked a great many times over a great many of them; described a number of their phenomena quite correctly; proposed, and in some cases performed, many ingenious experiments upon them; and indeed done almost everything that was to be done for them—except find out the one thing that we wanted to know.

As his malicious fortune would have it, he invited in that year (1841) a man of acute brains—James Forbes—to see what he was about. The invitation was accepted. The visitor was a mathematician; and after examining the question, for discussion of which Agassiz was able to supply him with all the data except those which were essential, resolved to find out the essential ones himself. Which in the next year (1842) he quietly did; and in 1843 solved the problem of glacier motion for ever: announcing, to everybody's astonishment, and to the extreme disgust and mortification of all glacier students—including my poor self, (not the least envious, I fancy, though with as little right to be envious as any one)—that glaciers were not solid bodies at all, but semi-liquid ones, and ran down in their beds like so much treacle. . . .

But fancy the feelings of poor Agassiz in his Hôtel des Neuchâtelois! To have had the thing under his nose for ten years, and missed it! There is nothing in the annals of scientific mischance—(perhaps the truer word would be scientific dulness)—to match it; certainly it would be difficult for provocation

to be more bitter,—at least, for a man who thinks, as most of our foolish modern scientific men do think, that there is no good in knowing anything for its own sake, but only in being the first to find it out.

Nor am I prepared altogether to justify Forbes in his method of proceeding, except on the terms of battle which men of science have laid down for themselves. Here is a man has been ten years at his diggings; has trenched here, and bored there, and been over all the ground again and again, except just where the nugget is. He asks one to dinner—and one has an eye for the run of a stream; one does a little bit of pickaxing in the afternoon on one's own account—and walks off with his nugget.—*Fors*, II., pp. 90, 91.

A Glacier is a River of Honey.—Above all substances that can be proposed for definition of quality, glacier ice is the most defeating. For it is practically plastic; but *actually* viscous;—and that tothe full extent. You can beat or hammer it, like gold; and it will stay in the form you have beaten it into, for a time;—and so long a time, that, on all instant occasions of plasticity, it is practically plastic. But only have patience to wait long enough, and it will run down out of the form you have stamped on it, as honey does, so that actually and inherently, it is viscous, and not plastic.—*Deucalion*, p. 56.

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